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14. ABSTRACT The long-term goal of this training program is to increase veterinary research manpower by providing research training to veterinary students. The proposed training program included joint degree programs (DVM/MPH, DVM/MS-CBS and DVM/MS-LAM) and the summer research program. Six trainees have graduated with two serving in the US Army Vet Corp, two engaged in biomedical research and 2 entered private practice. The 23 trainees recruited in the joint degree program are continuing their training and the 14 trainees, recruited in the summer research program, have completed their research projects. One trainee joined the US Army. No major problem was encountered with recruiting or maintaining trainee interests in the training program during the reporting period and hence we plan to continue the program as originally proposed.			
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INTRODUCTION:

The long-term goal of this training program is to increase veterinary research manpower by providing research training to veterinary students. The program is expected to develop a pipeline of research ready veterinarians to solve biodefense and public health problems facing our country, in general, and our armed forces in particular. The following training programs offered by Tufts Cummings School of Veterinary Medicine (TCSVM) were proposed for this purpose.

1. Summer Research Program
2. Four-year joint DVM/Master's degree in Public Health degree (DVM MPH) program
3. Four-year joint DVM/Master of Science degree in Laboratory Animal Medicine (DVM/MS-LAM)
4. Five-year joint DVM/MS in Comparative Biomedical Science (DVM/MS-CBS)

During the summer research program, veterinary students are trained to conduct mentored research under the guidance of a faculty. Veterinary students are also recruited in joint degree programs that allow more specialized training in public health and laboratory animal medicine and more in-depth research training in comparative biomedical sciences.

Body:

This is a training grant with training opportunities in multiple programs, and this progress report includes accomplishment from August, 2008 to August 2009 (third year) of this multi-year program.

Program Implementation: As proposed in the application, veterinary students were informed of the training program soon after receiving the award notice. A website as well as a brochure was created to inform veterinary students and faculty (<http://www.tufts.edu/vet/researchtraining/defense.html>). The website included the program description, responsibilities of trainees and mentors, list of program faculty and individual program directors and an application package. In addition, students and faculty were informed of the program via email with reference to the website and a seminar was held to explain the program to students and program faculty. Prospective trainees were asked to contact program faculty for summer research projects and program directors for the joint-degree programs.

Recruitment: The goal of the program during the reporting period was to recruit 14 trainees in the Summer Research Program, 6 trainees in DVM MPH, 7 trainees in DVM/MS-LAM and 2 trainees in DVM/MS-CBS programs. Twenty one students applied for the 14 trainee positions for the Summer Research Program, 3 students applied for the DVM MPH, 6 students applied for the DVM/MS-LAM program and 2 students applied for the DVM/MS-CBS program. Because of limited positions, 14 trainees out of 21 applicants for the Summer Research Program were selected based on the scientific merit of the proposal, academic standing in the veterinary school, relevance to biodefense and stated interest in an army career. All applicants in the other programs were selected because of availability of the slots; all applicants met the criteria for acceptance. All recruited trainees in various combined degree programs are listed in table 1, and in the summer research program are listed in table 2.

Progress to date: Three trainees each in DVM/MS-LAM and DVM MPH programs and one trainee in DVM/MS-CBS have graduated in 2009. Please note that one trainee (Elliot Gerber) has completed the requirements for both DVM MPH and DVM/MS-CBS programs. Of the 6 graduates, two are serving in the US Army veterinary Corp, two are involved in biomedical research and two entered private practice. All other trainees in the DVM/MS-LAM and DVM MPH are still in the program, are in good academic standings and are expected to complete their training in years listed in table 1. Of the four trainees currently in the DVM/MS-CBS program, one has completed all the requirements for the MS portion of the program, one submitted a thesis and two started the program this year. All 14 trainees in the summer research program have completed their research projects (Table 2) and are in the process of preparing research reports due by the middle of September, 2009. These trainees will present their research work at the annual veterinary student research day on October 7, 2009. They will also compete for three awards based on the written report and the oral

presentation, and will receive the award at the end of the annual veterinary student research day. Note that all trainees in DVM/MS-CBS completed the summer research program before entering the combined degree program.

All trainees were required to and attended a special information session by Major Lawler on career opportunities in the US Armed forces for veterinarians. This session was organized by the local US Army recruiting officers and was held on November 13, 2008. Please note that one of the 2008 trainees (Ms. Jennifer McRobbie) has joined the Army during the academic year.

Table 1: Trainees recruited in 2007, 2008 and 2009 (in bold) in various combined degree programs

A. DVM/MS-LAM Program

Name of Trainee	Training Program	Training Completion Year	DVM Graduation Year	Comments
Kristina Asselin	DVM/MS-LAM	2010	2010	
Jessica Connolly	DVM/MS-LAM	2009	2009	Serving in US Army Vet. Corp.
Julia Goldman	DVM/MS-LAM	2011	2011	
Amanda Graveline	DVM/MS-LAM	2011	2011	
Amory Koch	DVM/MS-LAM	2011	2011	
Wenjun Li	DVM/MS-LAM	2009	2009	In Biomedical Research
Lindsey Miller	DVM/MS-LAM	2010	2010	
Mayrav Moreshet	DVM/MS-LAM	2009	2009	In Biomedical Research
Diane Peters	DVM/MS-LAM	2012	2012	
Melissa Timm	DVM/MS-LAM	2010	2010	
Stephanie Woods	DVM/MS-LAM	2011	2011	

B. DVM MPH Program

Name of Trainee	Training Program	Training Completion Year	DVM Graduation Year	Comments
Karen Alroy	DVM MPH	2011	2011	
Colin Basler	DVM MPH	2012	2012	
Lauren Bifano	DVM MPH	2012	2012	
Amber Durrell	DVM MPH	2013	2013	
Anne Fleming	DVM MPH	2013	2013	
Elliott Garber	DVM MPH	2009	2009	Serving in US Army Vet. Corp.
Katherine Haman	DVM MPH	2012	2012	Transferred to another Veterinary school
Tammy Han	DVM MPH	2009	2009	Private practice
Miranda Hillyard	DVM MPH	2011	2011	Fogarty Scholar
Lauren Krone	DVM MPH	2013	2013	
Jennifer McRobbie	DVM MPH	2010	2010	Joined Army in 2009
Cecilia Murch	DVM MPH	2013	2013	
Misha Robyn	DVM MPH	2009	2009	Private practice
Marieke Rosenbaum	DVM MPH	2011	2011	

C. DVM/MS-CBS Program

Name of Trainee	Training Program	Training Completion Year	DVM Graduation Year	Comments
Elliott Garber	DVM/MS-CBS	2008	2009	Serving in US Army Vet. Corp.
Jessica Hekman	DVM/MS-CBS	2010	2012	
Katherine Megquire	DVM/MS-CBS	2010	2012	
Marieke Rosenbaum	DVM/MS-CBS	2009	2011	Thesis submitted
Karyn Vonderstein	DVM/MS-CBS	2008	2010	Thesis completed

Summer Research Program: Fourteen trainees were recruited in the summer research program. The 2009 summer research trainee and the project titles are summarized in table 2, and the summary of each project is listed in appendix 2.

Table 2: Trainees recruited in 2009 Summer Research Program

Name of Trainee	Mentor	Project Title
Colin Basler V'12	Dr. G. Kaufman	Assessing the Effectiveness of the Dog Sterilization and Rabies Control Program at IAAS, Rampur, Nepal
Ashley Case V'12	Dr. J. Lindenmayer	Rabies Antibody Seroprevalence Among Mexican Bats
Rebecca Foelber V'11	Dr. S. Lawson	High Risk Practices in the Production and Marketing of Muscovy Ducks for Transmission of Highly Pathogenic Avian Influenza in Indonesia
Matthew Gordon V'12	Dr. M. Pokras	Juvenile Survival and Long Term Health of a Translocated Population of gopher Tortoises
Katherine Haman V'12	Dr. F. Tseng	Health Assessments and Antibiotic Resistance of Free-Ranging Atlantic Sharpnose (<i>Rhizoprionodon terraenovae</i>) and Bonnethead (<i>Sphyrna tiburo</i>) Sharks of the Coast of Florida and Georgia
Susan Hayhurst V'11	Dr. F. Tseng	Investigating Antibiotic Resistance and Treatment Effectiveness in Avian Patients in a New England Wildlife Rehabilitation clinic.
Jamie Lovejoy V'12	Dr. J. Lindenmayer	Economic Evaluation of Rabies Treatment and Prevention in Freetown, Sierra Leone
Lauren O'Connell V'11	Dr. E. Byrnes	Estrogen receptor alpha and activation of the amygdala following reproductive experience
Sarah Raabis V'12	Dr. E. Brum	Sustainable Food Security and Rural Family Livelihoods: A Descriptive Evaluation of Small-Scale Livestock Production in the Limpopo National Park Support Zone
Lydia Scheidler V'11	Dr. G. Kaufman	Risk Factors Associated with the Transmission of Tuberculosis in Captive Elephants in Nepal
Samantha Swisher V'12	Dr. R. Alders	Potential Impact of Improved Poultry Yields on Bushmeat Hunting in Limpopo National Park, Mozambique
Hannah Tadros V'12	Dr. G. Saperstein	Variety, Frequency of Use, and Medicinal Efficacy of Indigenous Medicinal Treatments Used by Donkey Owners in Giza, Egypt to Prevent and Treat Disease in Their Working Animals
Deborah Thomson V'12	Dr. G. Saperstein	Assessment of the Impact of Animal Husbandry Education in Heifer International-Donated Water Buffalo
Amy Vlazny V'11	Dr. S. Ayres	Survey of Tzeltal Maya Farmers' Knowledge of Swine Health and Husbandry Systems.

Each trainee in the Summer Research Program is required to complete a survey to provide feedback on their research experience and future plan. The survey data for the reporting period will be available after the due date of this progress report and will be included in future progress reports. The survey data from 12 trainees last year (2008) revealed the following: 100% had a stimulating research experience and 91% plan to obtain more research experience while in veterinary school, 32% considered entering a combined degree program, 91% were interested in getting involved in research after completing the DVM program and 17% were interested in joining the army.

Key Research Accomplishments

The goal of this program is to provide research training to veterinary students by allowing them to participate either in a research project over the summer months (Summer Research Program from June to August) or a year-long hypothesis driven research (DVM/MS-CBS). The short term summer research training usually does not result in the publication of a manuscript, as the trainees are still learning the research methods and the project is usually not completed during the summer months. Thus, the focus is to get the trainees interested in research including how to evaluate and prepare scientific publications. Since the final report of the 2009 summer research accomplishments is not due until the middle of September, 2009, i.e., after the due date of this progress report, key research accomplishment will be reported in the next annual progress report. Thus, the research accomplishment of 2008 summer research is included in this report (see appendix 1) and the major findings are summarized below.

1. Streptomycin, ampicillin and tetracycline resistant isolates were the most prevalent type of resistance phenotypes in both gull and wastewater isolates.
2. Chronic infusion of allopregnanolone into the medial preoptic area (MPOA) appears to increase anxiety.
3. A greater percentage of juvenile samples were found positive for parasites than adults monkeys in the rainforests of Costa Rica.
4. Initial results suggest presence of chronic aflatoxicosis in Indonesian domestic ducks.
5. The effect of reproductive experience on anxiety-like behavior may be due in part to changes in the modulation of anxiety-like behavior by activation of the estrogen receptor α subtype in primiparous females.
6. 85% of dogs diagnosed with sarcoptic mange showed noticeable improvement in clinical signs when treated with promeris.
7. An important perception revealed by this ethnographic study is that many poultry owners in West Java believe they can recognize HPAI, even though the signs they describe as pathognomonic for HPAI are seen with endemic Newcastle disease and other diseases.
8. Saliva has the potential to be a diagnostic sample for hormonal analysis and for pathogenic bacteria and viruses in free-living mountain gorillas.

In addition to summer research trainees, three trainees participated in the year-long hypothesis driven research in 2008. Two (Elliot Garber and Karyn Von Iderstein) of these two trainees have completed the project and the other trainee is in the process of finalizing the thesis. The abstracts of the completed projects are reproduced below:

Molecular characterization of *Giardia* and *Cryptosporidium* isolates from children and cattle in southern India.

Trainee: Elliott Garber; Mentor: Dr. Saul Tzipori

Abstract: *Giardia duodenalis* and *Cryptosporidium* spp. are leading causes of diarrhea in India, but little is known about the assemblage types or species commonly infecting children and calves from rural areas. Zoonotic transmission has been hypothesized to be a significant factor in human giardiasis and cryptosporidiosis worldwide, but the relative importance of zoonotic and anthropozoonotic transmission is unknown. Recent molecular studies identify the genetic heterogeneity present among *G. duodenalis* and *Cryptosporidium* isolates and indicate that further genetic characterization is necessary to more fully understand the population structures of these parasites and design methods for their control. Stool samples from 70 children and 56

calves of the same households were collected over a three-month period in a rural district of southern India. PCR-RFLP at the triose phosphate isomerase (*tpi*) gene and at the small subunit ribosomal RNA (ssu-rRNA) locus were used to detect and identify *G. duodenalis* assemblage and *Cryptosporidium* species, respectively.

G. duodenalis assemblages A and B were isolated from children and cattle, and assemblage B was the predominant type identified in both. Five households were identified in which children and calves were both infected with *G. duodenalis* assemblage B during the study period, suggesting the possible involvement of zoonotic or anthropozoonotic transmission cycles. Microscopy and PCR-RFLP results for *Cryptosporidium* showed low prevalence of *C. parvum* infection in both children and calves. These results provide important insight into the population structure of *G. duodenalis* and *Cryptosporidium* in rural southern India and suggest the possibility of zoonotic transmission of *G. duodenalis* assemblage B.

THE ROLE OF STEM CELL ANTIGEN (Sca-1) EXPRESSION IN THE CONTROL OF LUNG REGENERATION AND PROGENITOR CELL FUNCTION

Trainee: Karyn Elizabeth Von Iderstein; Mentor: Dr. Andrew Hoffman

Abstract: Stem cell antigen-1 (Sca-1), a murine-specific stem cell marker used in fluorescence activated cell sorting, plays a role in the regulation of proliferation and differentiation of progenitor cells during tissue repair. Sca-1 has been used to isolate pulmonary stem cells, including the bronchioalveolar stem cell (BASC), which displays progenitor cell properties *in vitro* and increases in abundance during lung regeneration *in vivo*. To determine the role of Sca-1 dose during lung regeneration, we performed pneumonectomy (PNY) in 1) C57Bl/6 mice, which express high levels of Sca-1 in bone marrow, 2) BALB/c mice, which have markedly lower Sca-1 expression in bone marrow, and 3) Sca-1+/EGFP reporter mice, which are heterozygous for Sca-1 and express enhanced green fluorescent protein (EGFP) targeted to the Sca-1 locus. Lung function, BASC abundance, and Sca-1 expression were analyzed in each strain following PNY. Our findings indicate that while C57Bl/6, BALB/c, and Sca-1+/EGFP mice regrow their lungs following PNY, there are differences in this process between strains. Sca-1 (or GFP) expression increases following PNY. Both BALB/c and Sca-1+/EGFP strains show a decrease in BASC abundance relative to C57Bl/6. Future studies are needed in order to determine the necessity of Sca-1 (using a null model) as well as the importance of the BASC in lung regeneration.

Reportable Outcomes:

1. Six (6) trainees were recruited in the DVM MPH joint degree program
2. Three (3) trainees were recruited in the DVM/MS-LAM joint degree program
3. Two (2) trainees were recruited in the DVM/MS-CBS joint degree program
4. Fourteen (14) trainees were recruited in the summer research program
5. One (1) trainee (Jennifer McRobbie, 2008 summer research trainee and DVM MPH participant) joined the US Army in 2008.
6. Two trainee completed theses as a partial requirement for the degree of DVM/MS-CBS.
7. Six trainees graduated with two serving in the US Army Vet Corp, two engaged in biomedical research and two entered private practice.

Conclusion

The third year of this multi-year program is considered to be successful, as evidenced by the number of trainees recruited in the program and the activities of the graduates. Six trainees graduated with two serving in the US Army Vet Corp, two engaged in biomedical research and two entered private practice. All trainees in the combined degree program are making satisfactory progress. Two trainee completed theses and another has submitted a thesis as a partial requirement for the degree of DVM/MS-CBS. No peer-reviewed publications have resulted from the research conducted by the trainees. No major problem was encountered with recruiting or maintaining trainee interests in the training program during the reporting period and hence we plan to continue the program as originally proposed.

References: No peer-reviewed publications resulted from the Research activities of the trainees.

Appendices: The following documents have been appended:

1. Summary of 2008 Summer Research reports
2. Abstracts of 2009 summer research projects

Appendix 1

Summary of 2008 Research Reports

Awardee: Karen Alroy V'11
Mentor: Dr. Julie Ellis
Research Project: Herring Gulls, *Larus argentatus*, as vectors of pathogenic *Escherichia coli* in Coastal Environments.

Summary: Antimicrobial resistant bacteria are an emerging public health concern. This study aimed to determine the prevalence of antibiotic resistant strains of *Escherichia coli* cultured from wild Herring Gulls (*Larus argentatus*) and from human wastewater at Cape Cod, Massachusetts. Bacterial sensitivity was tested with seven types of antibiotics: ampicillin, ciprofloxacin, chloramphenicol, gentamicin, streptomycin, sulfamethoxazole-trimethoprim, and tetracycline. Strains of *E. coli* that exhibited resistance phenotypes were genetically analyzed in order to identify the prevalence of various antibiotic resistance genes. Of the 49 wastewater isolates 59.2% percent were resistant to at least one antibiotic, and 40.8% demonstrated multi-drug resistance. Of the 115 gull isolates, 15.6% were resistant to one antibiotic, and 0.9% demonstrated multi-drug resistance. Streptomycin, ampicillin and tetracycline resistant isolates were the most prevalent type of resistance phenotypes in both gull and wastewater isolates. One or more virulence genes were identified in 3/12 (25%) of the antibiotic resistant gull isolates. This research is one of the first studies documenting antibiotic resistance determinants in wildlife of the United States.

Awardee: Sarah Carter V'10
Mentor: Dr. Gretchen Kaufman
Research Project: Determining Geographic Risk Factors for Disease Transmission between Livestock and Elephants in Chitwan, Nepal.

Summary: Animals in the Buffer Zone around Chitwan National Park in Nepal suffer from many of the same diseases, such as tuberculosis and parasites. A GPS unit was used to navigate to randomly designated points within the areas used by captive elephants. Characterization of the landscape at each point was noted. The wetness of the landscape, type of landscape, and evidence of elephants, rhinoceros, deer, antelope, cattle, buffalo, goats, and sheep were taken. Fecal samples were collected at these locations when available and analyzed for parasites. Further analysis will be conducted utilizing GIS to map the data and to identify patterns of land characterization and use.

Awardee: Philip Gerwin V'11
Mentor: Dr. Phyllis Mann
Research Project: The Role of Progesterone and Its Metabolites on the Onset of Maternal Behavior during Pregnancy in Rats.

Summary: Understanding maternal behavior has important applications to both social and public health. While much is known about the hormones of pregnancy, little is known about where they act, their mechanisms of action and how they inhibit or stimulate the display of maternal behavior. This research aimed to elucidate these mechanisms of inhibition and stimulation in both the ventromedial nucleus of the hypothalamus (VMH) and the medial preoptic area (MPOA), respectively. The VMH is known to be part of an inhibitory neural circuit that regulates maternal behavior. It is believed that progesterone may be involved in this inhibitory mechanism and that its withdrawal just prior to parturition leads to the disinhibition of maternal behavior. It has also been suggested that some of progesterone's actions may be due to its reduced metabolites, including allopregnanolone. This experiment explored the role of progesterone metabolites following administration into the MPOA and VMH. Cannulas attached to osmotic minipumps were placed into the VMH in one group of rats and the MPOA in another on day 11 of pregnancy containing either finasteride, allopregnanolone, or vehicle. Maternal behavior testing began on day 15 and continued for 7 days or until the

primigravid rat displayed maternal behavior. The rats were also tested on the elevated plus maze (EPM) on day 15. Results were limited due to a low number of subjects. However, chronic infusion of allopregnanolone into the MPOA appeared to increase anxiety. With some improvements, this study design can be successful in elucidating the mechanisms involved with the onset of maternal behavior.

Awardee: Sara Heslop V'11
Mentor: Dr. Louise Maranda
Research Project: Prevalence of Gastro-intestinal Parasites in White-faced Capuchin Monkeys, *Cebus capuchinus*, in Heavily Touristed National Parks in Costa Rica Compared to Isolated National Parks.

Summary: Ecotourism is rapidly increasing in the rainforests of Costa Rica at a time when more and more Costa Rican wildlife is becoming threatened. It is important to monitor the health of wildlife now so that changes can be recognized early and effective management practices may be implemented to avoid greater damage. White-faced capuchins, *Cebus capuchinus*, are one species which often has increased contact with humans due to tourists feeding the monkeys or allowing them to steal food. Previous studies recognized parasitic infection levels as an indicator of changing health status in wildlife. This study provides an estimate of gastrointestinal parasite infection in white-faced capuchins in Manuel Antonio National Park, Costa Rica. A coprological survey was completed by collecting fresh fecal samples and completing a direct fecal smear, fecal floatation, and dilution egg counts to estimate the number of eggs per gram feces. Gastrointestinal parasites were present in 19 of 33 samples collected and studied. Cestodes, ascarids, trichurids, and strongylids oocytes were observed. A greater percentage of juvenile samples were found positive for parasites than adults. Adult females had the lowest prevalence of parasites, however fewer females were sampled. Future studies may build upon the base-line estimated in this study to determine whether capuchin populations which are not exposed to intense human contact and tourism experience lower parasite loads than the capuchins in this national park.

Awardee: Miranda Hillyard V'10
Mentor: Dr. Robyn Alders
Research Project: Aflatoxicosis in Indonesian Domestic Ducks: Implications for H5N1 Highly pathogenic Avian Influenza (HPAI) Vaccination Campaigns.

Summary: Highly pathogenic avian influenza A (HPAI) subtype H5N1 is now endemic in Indonesia. HPAI poses a serious threat to both poultry industry and to human health in Indonesia. Indonesia is considered the most likely source of a human influenza A pandemic. Vaccination in poultry is widely used to slow the spread of the disease and prevent human infection. Vaccination programs have focused primarily on chickens in the past but are currently expanding to include domestic ducks. Ducks serve as an important reservoir for the virus and contribute to its spread. Successful vaccination depends on a competent immune system. Aflatoxin is a mycotoxin produced by *Aspergillus* sp. molds and is commonly found in commercial livestock feeds. Ducks in Indonesia could be immunosuppressed due to aflatoxin exposure. The aim of this study was to test for aflatoxicosis in ducks and determine the implications this has for H5N1 vaccination and control programs. There was great variation in gross pathological lesions in the domestic ducks purchased at market. There appeared to be clustering of lesions; for example, ducks from one market and region had a higher incidence of fungal lesions than ducks from another market. However, formal analysis of this has not yet been performed. The histological analysis has not yet been completed, and so it is not yet possible to make estimations of aflatoxin exposure. However, yellow discoloration of the liver was a commonly noted gross lesion, and this fatty change is consistent with chronic aflatoxicosis.

Awarded: Lauren O'Connell V'11
Mentor: Dr. Robert Bridges
Research Project: Estrogen, Maternal Behavior and Stress

Summary: Previous studies in rats have demonstrated that reproductive experience (i.e. pregnancy and lactation) can result in long-term alterations in hormone secretion, hormone receptor number, and hormone receptor sensitivity. Similar effects have been observed in other species including sheep and humans. In rats, a number of studies have also examined behavioral changes that persist following reproductive experience. One such behavioral effect is a significant reduction in anxiety-like behavior in reproductively experienced females.. The current experiment was designed to determine whether the reduction in anxiety-like behavior observed in reproductively experienced rats is due to a shift in the ability of estrogen receptor α to modulate anxiety-like behavior. Using a standard tool for assessing anxiety-like behavior in rodents, the Elevated Plus Maze (EPM), anxiety-like behavior in ovariectomized primiparous (pregnancy and 21-days lactation/mothering) and age-matched, nulliparous females was examined. All subjects were ovariectomized beginning at least 2 weeks after primiparous females weaned their litters. One week later, subjects were injected (subcutaneously) with either the estrogen receptor α agonist PPT (1.0 mg/kg/ml), or vehicle (50% DMSO). PPT-treated primiparous females demonstrated a reduction in anxiety-like behaviors when compared to their vehicle-treated counterparts. No significant effect of PPT on anxiety-like behavior was observed in nulliparous females, although there was a tendency towards increased anxiety-like behavior. These findings suggest that the effect of reproductive experience on anxiety-like behavior may be due in part to changes in the modulation of anxiety-like behavior by activation of the estrogen receptor α subtype in primiparous females.

Awardee: Kathleen Riley V'10
Mentor: Dr. Gretchen Kaufman
Research Project: Diagnosis and Treatment of Mange in the Street Dog Population of Kathmandu, Nepal.

Summary: Mange, a parasitic skin disease caused by burrowing mites, is a common problem for dogs worldwide. In this study, we investigate the prevalence of sarcoptic and demodectic mange in dogs with dermatological signs in the street dog population of Kathmandu, Nepal. Dogs were classified as to severity of signs on a scale of 0-3. We compare the sampling methods of hair plucking with deep skin scraping for diagnosis of mange, and evaluate the effectiveness of a new treatment, topical metaflumizone and amitraz, sold as Promeris for Dogs. In 54 dogs selected for dermatological signs of alopecia, pruritis, redness, and possible crusting or hyperkeratosis, only one dog was diagnosed with demodectic mange by deep skin scraping. Of the eighteen dogs from which skin scraping samples could be collected, ten were found to have sarcoptic mange mites. Remaining dogs were presumed to have sarcoptic mange based on clinical signs, and in some cases, close contact with positively diagnosed dogs. Dogs were treated 3 times at 2 week intervals with Promeris, and evaluated weekly for 6 weeks total. At final evaluation on Day 42, 85% of dogs showed noticeable improvement in clinical signs, averaging 1.21 points improvement on the 0-3 scale. Vomiting was noted in four dogs within 24 hours of initial treatment.

Awardee: Annie Shea V'11
Mentor: Dr. Scott Shaw
Research Project: The Use of Directed Education to Improve the Rate of Hand Washing in a Veterinary Hospital.

Summary: Since Semmelweis first made the observation in 1846 that disease transmission could be reduced with good hand washing technique between patients, human and veterinary hospitals have struggled to improve health care provider compliance with frequent and consistent hand washing and, more recently, the use of antibacterial hand rubs. There is extensive data in human hospitals that increasing hand washing compliance can reduce the rates of hospital-acquired infections. We hypothesize that a multi-modal, inclusive, long-term educational campaign can significantly increase hand washing behavior among hospital employees at Tufts. Hand hygiene rates in June were only 20%. 6% of the time foam was used, 8.6% of the time soap and water was used either before or after patient interactions. 6% of the time gloves were properly used. The rates of hand-washing and/or use of antibacterial foam did not differ very much among faculty, students, residents/interns and technicians or between shifts. The change in total hand hygiene (foam, properly washing hands and properly using gloves) improved from 20% to 42% ($X^2 = 33.05$, $p < 0.01$) between June and August. 36% of the time staff used foam, 5% of time staff washed their hands either before or after patient interactions and 1% of the time gloves were used properly in August. Foaming, the focus of the educational campaign,

increased by 30%. Some of the foaming was displacement from the washing with soap and water and gloves categories (since these values actually decreased). However, there was a substantial overall increase in the rates of foaming. Although there is extensive data in human hospitals about rates of hand hygiene and how to improve staff compliance, there is little similar data in veterinary hospitals. Our study showed 'proof of concept' that similar methods can be applied with success in a veterinary hospital. Our hope is that, over time, this change will become institutionalized and therefore sustainable in the future.

Awardee: Angela Snell V'11

Mentor: Dr. Robyn Alders

Research Project: A Participatory Approach to Understand Poultry Farmer Perceptions of Avian Influenza (H5N1).

Summary: This study is ethnographic and serves to identify perceptions of poultry owners in West Java, Indonesia. Their perceptions are crucial to enhancing the effectiveness of disease control programs. The focus of this study is to elucidate how poultry owners perceive poultry disease and disease prevention. The information obtained from 82 interviews in two regions in West Java province, is qualitative and was gleaned through open-ended questioning. Through analysis, trends have been detected and can help pinpoint perceptions common to poultry owners in West Java. In general, poultry owners are shown to have many different names for and descriptions of endemic poultry diseases. Although most poultry owners consider the sickness to be caused by components of weather and climate, they have disparate views about the best strategies to treat and prevent disease. An important perception revealed by this study is that many poultry owners believe they can recognize HPAI, even though the signs they describe as pathognomonic for HPAI are seen with endemic Newcastle disease and other diseases. There exists a need for effective communication strategies to help poultry owners understand the important difference between HPAI and other endemic poultry diseases.

Awardee: Christine Taylor V'11

Mentor: Dr. Peter Daszak

Research Project: Investigating the Emergence of SARS and SARS-like Coronaviruses.

Summary: The SARS epidemic that emerged in the Guangdong province of southern China in late 2002 affected 8000 in people in 32 countries and claimed 774 lives. Bats of the genus *Rhinolophus* were identified as the reservoir host in 2005, yet a mechanism of SARS emergence has not been elucidated. In the case of SARS our knowledge of the reservoir host is limited and key data on the interactions among the host species, incident carriers, and humans is necessary to be able to predict and prevent future disease emergence. From June to August 2008 we trapped and sampled 392 bats in the Hainan province of southern China to investigate the ecology of these reservoir hosts and examine their natural viral burden.

Awardee: Stephen Wilson V'11

Mentor: Dr. Jon Epstein

Research Project: Infectious Risks of Bushmeat Hunting on Malaysia

Summary: This is a pilot study in collaboration between the Consortium for Conservation Medicine (CCM) and the National Public Health Laboratory under the Malaysian Ministry of Health to begin to set up the infrastructure to later assess the risk of zoonotic pathogen transmission from wildlife to hunters and restaurant workers who are shooting, butchering and cooking wildlife as part of the bushmeat trade in Peninsular Malaysia. During the course of this study, personal contact was established between CCM staff and restaurant owners whose establishments serve bushmeat (defined as animal captured from wild populations, not farm raised). Some of the restaurant owners in this study had already been contacted by CCM and agreed to participate in the study, and one new restaurant was identified during the course of this project. The meetings between myself, CCM staff, and restaurant owners were designed to serve two purposes: to establish a relationship between the restaurant owners, kitchen workers and CCM staff; and to begin an exploratory observational study whose purpose was to document potential occupational risks to zoonotic

pathogen exposure during the food preparation process. A second aspect of this study was to develop laboratory PCR protocols for extracting nucleic acid from hunted animal blood samples in filter paper, collected by hunters enrolled in the Zoonotic Emergence Network (ZEN) project. RNA extraction protocols as well as a PCR protocols were developed at the National Public Health Laboratory. Blood samples used were from *Pteropus vampyrus*, the natural reservoir for Nipah virus, a highly fatal zoonotic paramyxovirus. Protocols were successfully developed that detected the presence of pteropid bat RNA and Nipah virus RNA in dried blood spots of varying quality.

Awardee: Tierra Wilson V'10
Mentor: Dr. Jean Mukherjee
Research Project: Development of a Saliva Collection Technique for Improved Health-Monitoring of Free-Living Mountain Gorillas.

Summary: Health monitoring of free-living endangered Mountain gorillas (*Gorilla beringei beringei*) in Rwanda, Uganda and the Democratic Republic of Congo is currently done with minimal intervention through direct observation and collection of fecal samples for diagnostic screening (4). This non-invasive method is beneficial for minimizing stress however it makes early detection and diagnosis of disease outbreaks difficult because many pathogens are not detectable in feces. There are currently two recurring disease outbreaks within the population in Rwanda that need further investigation to diagnose. One causes respiratory disease and is suspected to be of human origin and the other consists of herpes-like skin lesions on the nose and mouth. New and innovative non-invasive diagnostic techniques are urgently needed to identify and understand the mode of transmission of these diseases.

This project focused on developing a non-invasive method for saliva collection from discarded forest food of free-living Mountain gorillas for diagnostic testing. Subjects included free-living habituated Mountain gorillas in the Parc National des Volcans and a combination of orphan Mountain and Grauer's gorillas (*Gorilla beringei graueri*) from the Kinigi intirum quarantine facility in Rwanda. Several sample collection techniques were compared using an α -amylase EIA and swabbing was determined to be the most effective technique. Various plant materials were also compared for ease of collection. Wild celery (*Peucedanum linderi*) was the most readily available plant material during the months of June and July and produced the most consistent saliva extraction. Saliva has the potential to be a diagnostic sample for hormonal analysis and for pathogenic bacteria and viruses. It also has the potential to be a source of genomic gorilla DNA for genetic analysis.

Appendix 2

Abstracts of 2009 summer research projects

Awardee: Colin Basler V'12

Mentor: Dr. Gretchen Kaufman

Research Project: Assessing the Effectiveness of the Dog Sterilization and Rabies Control Program at IAAS, Rampur, Nepal

Summary: Rabies continues to pose a serious threat in many parts of the developing world, including Nepal. In the recent past, a dog sterilization and vaccination program has been implemented in the Chitwan district of Nepal in order to reduce the incidence of rabies and increase the capacity to implement rabies prevention programs within the country. My goal is to determine the effectiveness of the sterilization and vaccination program. In order to determine the program's effectiveness, the residents of four communities where the sterilization/vaccination program has been operating will be interviewed in order to determine their level of knowledge of rabies as well as their attitudes and behaviors that impact rabies prevention. The results of the survey will be compared to results from four similar communities which the sterilization/vaccination program has not yet reached. In addition to the survey, a census of the dog population will be taken in each village in order to determine the proportion of dogs that have been sterilized by the program. This information will help determine the effectiveness of the sterilization/vaccination program and will also give baseline data for the four communities which have not been involved in the program.

Awardee: Ashley Case V'12

Mentor: Dr. Peter Daszak, Dr. Jon Epstein, and Dr. Joann Lindenmayer

Research Project: Rabies Antibody Seroprevalence Among Mexican Bats

Summary: In recent years, the emergence of novel diseases and the re-emergence of many others has become a global problem. Disease outbreaks not only carry a huge toll on morbidity and mortality but also they cost societies billions of dollars. The majority of emerging diseases are zoonotic and the majority of these zoonotic diseases arise from wildlife. Moreover, many of the disease that have emerged in the last several years including Nipah, Hendra virus and SARS have had origins in various bat species. Previous studies have indicated that anthropomorphic change drives disease emergence and outbreaks in both human and wildlife populations. Some of these anthropogenic changes include deforestation, agricultural encroachment, and road and dam building. Changes to the environment such as these create new selection pressures that alter the relationship between hosts and pathogens allowing pathogens to thrive in these new environments. Rabies is considered a re-emerging disease throughout much of the world and is a priority disease for control according to the World Health Organization. In recent years, bat borne rabies has become an increasing public health problem in both Europe and the Americas. The aim of this study is to better understand the impact that anthropogenic change has on the rabies antibody titer of bats living in environments impacted by human-induced ecological change and bats living in environments that are not impacted by such change. The study will be conducted by collecting blood samples from two populations of Mexican bats, one population will be from an area that has been impacted by human-induced ecological change and the other will be from an undisturbed area. The rabies antibody titer of the bats will be determined using an Enzyme-linked ImmunoSorbent Assay (ELISA), specifically the The ELISA PLATELIA™ RABIES II, Bio-Rad assay will be used. The total number of positive and negative titers for each species at each site will be counted. The mean, standard deviations and confidence intervals will be determined. To determine whether the difference between the means is statistically significant, statistical tests of significance such as a T-test will be performed.

Awardee: Rebecca Foelber V'11

Mentor: Dr. Stacie Lawson

Research Project: High Risk Practices in the Production and Marketing of Muscovy Ducks for

Transmission of Highly Pathogenic Avian Influenza in Indonesia

Summary: Given that Indonesia is the country with the most human infections of highly pathogenic avian influenza (HPAI) H5N1, it is important to understand the epidemiology of the disease, including common reservoirs and modes of virus transmission. Many scientists have proposed that waterfowl are a reservoir for HPAI, but more studies are needed to examine the exact role domestic waterfowl play in virus transmission in Indonesia. Research on domestic waterfowl has focused on Pekin ducks and Indian runner ducks, while little is known about the rarer Muscovy ducks. However, Indonesian livestock officials have recognized that Muscovy ducks are raised differently than other ducks, in that Muscovy ducks are raised in small flocks in a free-range setting while others are managed more intensively. It is important to understand the husbandry styles of these birds, since the risk of HPAI infection of poultry depends on several factors, including the manner in which birds are raised on farms. Additionally, the WHO and FAO have discovered that, of many types of birds sold at markets, Muscovy ducks are the highest risk factor for environmental contamination. Thus, a study that focuses on the production system and market chain of Muscovy ducks can help illustrate possible risk factors for transmission of HPAI H5N1 in Indonesia.

This study will be organized in two phases: the first will address the marketing of Muscovy ducks, while the second will address the husbandry of the birds at the village level. Phases I and II will include semi-structured interviews with Muscovy duck vendors and farmers, respectively, in Western or Central Java. A semi-structured interview technique is preferred over a standardized questionnaire because it allows for more detailed answers and further exploration of certain responses. Based on the qualitative data obtained from the interviews, a report will be compiled that addresses the marketing and husbandry of Muscovy ducks and identifies points throughout the process of raising and marketing ducks that may increase the risk of infection and transmission of HPAI. Overall, this study attempts to investigate the possible role that these ducks may play in maintaining the endemicity of avian influenza in bird populations, after which recommendations can be made to better protect humans and animals from infection and further spread of HPAI H5N1.

Awardee: Matthew Gordon V'12

Mentor: Dr. Mark Pokras

Research Project: Juvenile Survival and Long Term Health of a Translocated Population of Gopher Tortoises

Summary: Gopher Tortoises are found in the southeastern United States ranging from southern South Carolina to Florida and west to southeastern Louisiana. Populations have shown declines and the tortoise is currently considered a Species of Special Concern throughout its range. It is federally protected in Louisiana, Mississippi, and western Alabama and was reclassified to Threatened by the Florida Fish and Wildlife Conservation Commission (FWC) in 2007 (Berish, 2007). The primary cause of decline has been stated as habitat loss by the Florida Fish and Wildlife Conservation Commission (FWC 2007). Due to habitat loss, translocation of the gopher tortoise has become a key element of many conservation plans. However, inadequate long term research has been done on the effectiveness of this tool. In addition, research is lacking on gopher tortoise health in general.

The population of gopher tortoises on St. Catherines Island in Georgia represents one of the first translocated populations in the state. The population provides a unique opportunity to collect needed data on the effectiveness of translocation for this species. This study will focus on two specific aspects. The first will be survival/growth of juveniles tortoises. This will be accomplished through the capture of juveniles and collection of growth and health data. The second aspect of the study will be a continuation of an ongoing mark-recapture health assessment study. This will be accomplished through the capture of 15-20 adult tortoises. Data collected will aid in tracking the health of the population as well as establishing base line data for gopher tortoises.

Awardee: Katherine Haman V'12

Mentor: Dr. Flo Tseng

Research Project: Health Assessments and Antibiotic Resistance of Free-Ranging Atlantic Sharpnose (*Rhizoprionodon terraenovae*) and Bonnethead (*Sphyrna tiburo*) Sharks off the Coast of Florida and Georgia

Summary: Baseline health assessments will be performed and the incidence rate of antibiotic resistance (ABR) in bacteria cultured from cloacal swabs will be evaluated in two species (Atlantic Sharpnose and Bonnethead) of free-ranging shark off the coast of Georgia and Florida. These samples will be collected from sharks captured by trawling on the *RV Georgia Bulldog* during June and July of 2009. Health parameters and diagnostic testing will include physical examination, body weight and morphometric measurements, complete blood counts and plasma biochemistry panels. These data will be analyzed for correlation with the presence or absence of ABR and a variety of heavy metal and organochlorine contaminant levels. These data will also be geospatially quantified with the variables (1) distance from shore and (2) distance from river outlet via ArcMap GIS software. The American Association of Zoological Veterinarians (AAZV) recently (January 2009) issued a call for research to obtain baseline health parameters in order to address and understand the physiological characteristics that affect captive sharks and result in spinal deformities. This project is designed to address these research needs and our data will be made public. This project will also provide information on an important public health concern: antibiotic resistance. Both the Atlantic Sharpnose and the Bonnethead are recreationally fished and thus regularly come into contact with humans. Our understanding of the geospatial distribution of ABR and the health status of these sharks will improve our ability to monitor and protect humans from potentially harmful transmission of bacterial pathogens, provide information necessary to maintain healthy sharks, both captive and wild, and indicate the level to which overuse of antibiotics has caused their leaching into the environment at large.

This project is a collaborative effort between Tufts University Cummings School of Veterinary Medicine, University of California at Davis School of Veterinary Medicine (UC Davis), the Georgia Sea Turtle Center (GSTC), the South Carolina Department of Natural Resources (SCDNR), and the Georgia Department of Natural Resources (GaDNR).

Awardee: Susan Hayhurst V'11

Mentor: Dr. Flo Tseng

Research Project: Investigating Antibiotic Resistance and Treatment Effectiveness in Avian Patients in a New England Wildlife Rehabilitation Clinic

Summary: This study will investigate antibiotic resistance and treatment effectiveness in avian patients at a New England wildlife rehabilitation center. Antibiotic resistance is present and may be increasing in wild animal populations. Several studies have detected resistance in bacterial isolates from wildlife rehabilitation centers. Moreover, recent studies have indicated increases in drug resistance in wildlife patients from the time of admission to the time of release. In an effort to help the wildlife clinic assess the effectiveness of its current practices, this study will conduct a survey of bacteria and their resistance to antimicrobials in patients at the center, as well as a clinical comparison to determine if passerine bird cat-bite cases are significantly improved by treatment with amoxicillin trihydrate/clavulanate potassium. The goal of this study is to provide a better understanding of antibiotic use and resistance in a wildlife rehabilitation clinic in order to develop more informed treatment protocols and develop an awareness of the prevalence of antibiotic resistance in this setting.

Awardee: Jamie Lovejoy V'12

Mentor: Dr. Joann Lindenmayer

Research Project: Economic Evaluation of Rabies Treatment and Prevention in Freetown, Sierra Leone

Summary: The aim of this project is to collect primary data regarding the incidence and treatment of human exposure to canine rabies in Freetown, Sierra Leone for potential inclusion in a cost effectiveness analysis. This data would include descriptions of individual treatment seeking behavior, the process by which hospitals determine which treatment to provide, and the nature and costs of current human and canine treatments/vaccinations.

The collapse of Sierra Leone's infrastructure in the recent civil war has caused a significant increase in human rabies exposure. The level of exposure and mortality may easily be underestimated as many exposed individuals choose not to present their cases to the hospital. With proper management, rabies is preventable through the vaccination of reservoir populations, such as the domestic dog. Though this option seems viable,

current vaccination programs in Freetown, Sierra Leone are underfunded. A cost effectiveness analysis comparing current post exposure human treatments with a pilot spay/neuter and vaccination program could help determine which course of action would be the most beneficial to counteracting the rabies epidemic in this city.

The methods of collection will be interviews with Freetown residents about health seeking behaviors, interviews with hospital staff regarding treatment decisions and service costs, and finally an intensive review of hospital records for local rabies exposure statistics. These methods are further described in the body of this proposal. This data will be used to develop probability distributions allowing the estimation of human rabies mortality (actual and preventable), which can then be used to determine cost effectiveness of these programs.

Awardee: Lauren O'Connell V'11

Mentor: Dr. Elizabeth Byrnes

Research Project: Estrogen Receptor Alpha and Activation of the Amygdala Following Reproductive Experience

Summary: Last year in the laboratory of Dr. Bridges and Dr. Brynes, we observed an anxiolytic effect of PPT, an estrogen receptor- α (ER α) agonist, when administered to primiparous female rats. However, no such effect was seen when dealing with the nulliparous females. Next the lab examined c-fos activation, an indicator of neuronal activity, in the brains of rats with reproductive experience versus activation in the brains of nulliparous individuals. These studies revealed parity associated differences in the reaction to PPT treatment. The most striking difference was seen in the basolateral amygdala, with PPT treated parous animals having markedly higher levels of activation than their nulliparous counterparts. Since the amygdala plays a part in anxiety like behavior, this data indicates that the observed behavioral differences may be due to ER α -mediated activation in this brain region. The proposed experiment will use double labeling for ER α and c-fos within the amygdala, along with other brain regions known to be involved in one's response to stress, in an effort to determine whether PPT increases activity specifically in ER α -positive neurons or whether c-fos activation takes place in neurons that do not possess ER α .

Awardee: Sarah Raabis V'12

Mentor: Dr. Eric Brum

Research Project: Sustainable Food Security and Rural Family Livelihoods: A Descriptive Evaluation of Small-Scale Livestock Production in the Limpopo National Park Support Zone

Summary: The Limpopo National Park (LNP) of Gaza, Mozambique is home to many communities that struggle with food security, water availability, and sustainable income. The establishment of the Great Limpopo Transfrontier Conservation Area (GLTFCA), the linking of three Southeast African parks (Kruger National Park of South Africa, Gonarezhou National Park of Zimbabwe, and the LNP of Mozambique), has further complicated these issues. The GLTFCA was instituted to facilitate socioeconomic growth in the LNP region through the tourism sector; however, the local communities are facing intensified problems of increased wildlife encroachment, disease transmission, and further limitations to land and water resources. Currently, the International Rural Poultry Center (IRPC) of the KYEEMA Foundation is working to improve village poultry production: an important development strategy that provides food security and increases purchasing power of communities. The proposed research will involve further evaluation of village livestock, with an emphasis on small species production. A baseline questionnaire survey will be administered to households in four communities in the Massingir district of the LNP support zone as part of a Participatory Rural Appraisal (PRA) to better understand the role of livestock in rural livelihood strategies. To qualify and expand on data collected from household interviews, Focus Group Discussions will be organized in each community according to guidelines outlined in a relevant participatory tools manual (Bagnol 2008). The descriptive results of this baseline study will facilitate future improvements in animal health and wildlife management strategies of the IRPC to maintain sustainable food security and livelihoods for the people of LNP.

Awardee: Lydia Scheidler V'11

Mentor: Dr. Gretchen Kaufman

Research Project: Risk Factors Associated with the Transmission of Tuberculosis in Captive Elephants in Nepal

Summary: The aim of this study is to investigate the risk factors associated with the transmission of tuberculosis in captive elephants in Nepal. A 2006 study, which was the first to systematically test captive elephants in Asia for tuberculosis, found that at least 15 of the 120 elephants tested in Nepal were positive. Very little is known about the epidemiology of the disease in captive elephants in Asia. How these elephants are contracting tuberculosis and any additional risk factors, have not been documented.

A close-ended survey will be used to investigate the risk factors for the transmission of tuberculosis in captive elephants in Nepal. It will be given to owners and managers of captive elephants in order to assess information about the captive elephants in their care. The survey will be divided into five sections: general history, activities, diet, housing and interaction (with other elephants, livestock and wildlife).

Research into the risk factors associated with the transmission of tuberculosis in elephants has many positive implications for both human and animal health. Further knowledge on how captive elephants in Asia are contracting tuberculosis could inform the development of elephant management practices that reduce transmission, thus preventing more elephants from contracting this debilitating disease. Because tuberculosis is zoonotic, an understanding of how the disease is transmitted could also help improve the health of those in close contact with captive elephants in Asia. Increased knowledge of how tuberculosis is transmitted between people and animals also has broader public health implications for this important disease.

Awardee: Samantha Swisher V'12

Mentor: Dr. Robyn Alders

Research Project: Potential Impact of Improved Poultry Yields on Bushmeat Hunting in Limpopo National Park, Mozambique

Summary: I will investigate the roles that village poultry and bushmeat play in the diet, economy, and cultural practices of the communities in and around Limpopo National Park, Mozambique. Through household discussions and focus groups, I will determine the current uses of bushmeat in the area and whether poultry might prove an acceptable substitute for bushmeat if yields were improved. As developing countries around the world are struggling to balance wildlife conservation with the basic needs of the rural poor, it is imperative to find development strategies that benefit both people and wildlife. This research will investigate the contribution that village poultry might make to such a development strategy.

Awardee: Hannah Tadros V'11

Mentor: Dr. George Saperstein

Research Project: Variety, Frequency of Use, and Medicinal Efficacy of Indigenous Medicinal Treatments Used by donkey Owners in Giza, Egypt to Prevent and Treat Disease in Their Working Animals

Summary: My research will investigate the use of indigenous medicinal treatments, not generally prescribed or practiced by those in the modern veterinary profession, on donkeys in the outskirts of Giza, Egypt. I will travel with veterinarians staffing a mobile clinic sponsored by the UK-based charity, The Donkey Sanctuary, which treats between 25 and 200 hundred donkeys daily. I will both conduct a standard clinical exam on the donkeys and interview the owners to determine the frequency, variety, and efficacy of traditional treatments used. This descriptive study will establish a baseline of common practices used by laymen and often untrained 'farriers' in lower Egypt which could be further expanded in future studies to determine if knowledge and use of traditional treatments shows discrepancies between rural and urban regions of Egypt.

Awardee: Deborah Thomson V'12

Mentor: Dr. George Saperstien

Research Project: Assessment of the Impact of Animal Husbandry Education in Heifer International-Donated Water Buffalo

Summary: This project will detect subclinical and clinical mastitis in water buffalo owned by either untrained or trained Nepalese. The Nepal Chapter of Heifer International (HIN) operates a program to donate animals and train their recipients. HIN does not actively monitor the health of donated animals and, therefore, cannot assess their education program. By comparing my collected data, I will evaluate the impact of HIN's training sessions in the field. Mastitis, a potentially contagious condition where environmental bacteria enter an animal's udder, is a common concern of farmers world-wide due to its detrimental financial impact; in Nepal, the water buffalo is the predominant source of dairy and contributes substantially to the nation's economy. Animals with subclinical or clinical mastitis will produce less milk, which will be of poorer quality. At five villages where HIN-trained and HIN-independent handlers are found, I will detect mastitis by using the California Mastitis Test (CMT) and the Strip Cup test. With a sample size of at least 200 animals, I will use the Chi-squared Test to detect association and the crude Odds Ratio to assess the size of the effect. Adjusted Odds Ratios will be used to quantify the impact of training on mastitis. Information gathered by an objective questionnaire will explore the significance of confounding factors. HIN will use my results to improve their training sessions (e.g. prioritize time spent on certain topics) for future recipients of water buffalo.

Awardee: Amy Vlazny V'11

Mentor: Dr. Sandra Ayres

Research Project: Survey of Tzeltal May Farmer's Knowledge of Swine Health and Husbandry Systems.

Summary: This project aims to elucidate and evaluate Tzeltal Maya farmers' knowledge of swine health and disease in Aguacatenango, Chiapas, Mexico. I will use semi-structured interviews in a participatory approach to reveal perceptions about (1) domestic swine health, (2) occurrence and seasonality of common diseases, (3) impacts of diseases on production, and (4) when and how diseases are treated. I will specifically focus on identifying any disparities in these variables when comparing two systems of swine husbandry: the low-input practices used in raising the local pig breed, and a more intensive system of raising "farm breed" (mostly Yorkshire) pigs. I hypothesize that farmers recognize the local breed as more vigorous and resistant to disease, but that economic factors cause farmers to be more attentive to ailing farm breed pigs and more interested in restoring them to good health. By uncovering farmers' understanding of the roles of breed and husbandry in swine health and production, this study will help clarify the complex intersection between traditional and modern methods of animal husbandry in Aguacatenango. Research to this point has suggested that Tzeltal Maya animal producers use experiential and traditional methods of evaluating health, classifying diseases and determining appropriate treatments. The appropriate use of modern husbandry knowledge and veterinary medical practices to complement indigenous knowledge has not been determined, and represents an important concern for development efforts.

Animal production in rural indigenous communities in Mexico is a subsistence activity of great economic and cultural importance to its practitioners. From a practical perspective, domestic animals that can be raised on minimal inputs have entered essential roles in Mayan farmers' lives, through both providing dietary protein and acting as a quick source of funds for emergency expenses. Previous research and development work has suggested that traditional, indigenous knowledge of animal husbandry methods and ethnoveterinary practices provides low-income animal producers with techniques that are inexpensive, easily managed, locally available, culturally acceptable, and adapted to local ecological conditions.

Research to date in Aguacatenango has revealed general animal husbandry practices and the most common symptoms that afflict production animals. However, it remains to describe a more detailed classification of these symptoms; to investigate indigenous knowledge of the causes, associations, progression, prognoses and treatments of animal diseases; and to correlate indigenous empirical knowledge with objective data through the use of modern veterinary medical methods. The purpose of this study is to contribute to answering these questions, allowing for the development of region-specific, culturally appropriate recommendations for improvements in local production animal health. The findings from this study will be

disseminated back to the community through training and capacity building led by the Institute for Indigenous Studies at the Autonomous University of Chiapas, in conjunction with whom the present study is to be conducted.